

RollerFunctions!

Brief Overview:

Throughout the course of these three lessons, students will learn how to complete function tables by determining the rule and translating a word problem into a function table. Lesson 1 develops students' understanding of how to complete a function table; lesson 2 builds upon that knowledge by requiring students to consider the properties of a function table; lesson 3 extends this knowledge to word problems. Every lesson is embedded within an amusement park theme.

NCTM Content Standard/National Science Education Standard:

Algebra: Students will understand patterns, relations, and functions by describing extending, and making generalizations about geometric and numeric patterns and by representing and analyzing patterns and functions, using words, tables, and graphs.

Grade/Level:

4

Duration/Length:

3 lessons, 60 minutes each

Student Outcomes:

Students will:

- Complete a function table using a one-operation rule.
- Describe the relationship that generates a one-operation rule.
- Create a one-operation function table to solve a real world problem.

Materials and Resources:

Lesson 1

- Student Resource 1: Input/Output Table (1 copy per student; 1 on transparency for teacher)
- Student Resource 2: Discussion Questions (1 card per student)
- Student Resource 3: Uh Oh! (1 copy per student; 1 on transparency for teacher)
- Student Resource 4: Uh Oh Again! (1 copy per student)
- Student Resource 5: Fun At The Park (for students needing remediation)
- Student Resource 6: A Trip To The Park (for students needing enrichment)
- Teacher Resource 1: Uh Oh! answer key
- Teacher Resource 2: Uh Oh Again! answer key
- Teacher Resource 3: Fun At The Park answer key
- Teacher Resource 4: A Trip To The Park answer key
- Small, circular cereal (or other small manipulatives)
- Glue
- Centimeter cubes (or other manipulatives of your choosing)

- Function machine (a box with 2 holes cut out labeled “Input” and “Output”)
- Calculators

Lesson 2

- Student Resource 7: Which Is Easier? (1 copy per student)
- Student Resource 8: Watch Me Grow! (1 copy per student)
- Student Resource 9: Odd Man Out (1 copy per student)
- Teacher Resource 5: Which Is Easier? answer key
- Teacher Resource 6: Watch Me Grow! answer key
- Teacher Resource 7: Odd Man Out answer key
- Centimeter cubes (or other manipulatives of your choosing)
- Function machine (a box with 2 holes cut out labeled “Input” and “Output”)
- Calculators
- Chart paper
- Markers
- Pocket chart and index cards (or sentence strips)
- Cut-out triangles (roughly 10)
- Cut-out equals signs (roughly 10)

Lesson 3

- Student Resource 10: Ice Cream (1 cone per student; at least 3 scoops per student)
- Student Resource 11: Hot Dog! and Smile! (Divide students into Hot Dog! and Smile! groups. 1 copy per student)
- Student Resource 12: You Be The Writer (1 copy per student)
- Student Resource 13: Functions Are Fun! Summative Assessment (1 copy per student)
- Teacher Resource 8: Hot Dog! and Smile! answer key
- Teacher Resource 9: You Be The Writer answer key
- Teacher Resource 10: Functions Are Fun! Summative Assessment answer key
- Calculators
- Scissors
- Glue
- Cut-out pictures of ice cream cones and scoops
- Sample advertisements from magazines and newspapers
- Magazines and newspapers
- Chart paper with: *The cost of admission to the park is \$8 per person. On Monday, 23 people came to the park. On Tuesday, 20 people came to the park. On Wednesday, 31 people came to the park. How much money did the park make each day? How much total money did the park make this week?*



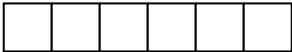


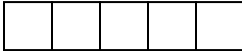
Development/Procedures:

Lesson 1

Pre-Assessment

- Distribute centimeter cubes and Student Resource 1.
- On the overhead, begin to create a function table with centimeter cubes. Have students lay the centimeter cubes on top of Student Resource 1 (they should write the number of cubes in the smaller squares within each cell) in the same arrangement as yours.
- Your centimeter cube function table should look like this:

Roller Functions!

Input	Rule	Output
		
		
		?
?		

- Have students work individually to determine the number of cubes in the missing output and input.

Launch

- Use the same data from above and have different students use cubes to put “in” and “out” of the function machine. If student 1 puts 8 cubes into the box, then student 2 would pull 3 cubes out of the box.
- *Ask: Justify why there would be 3 cubes in the output. (5 cubes are always being subtracted inside the machine).*
- *Ask: What if 21 cubes went into the machine, how many would come out? Explain. (16 would come out because the machine always subtracts 5).*
- *Ask: Predict how many cubes would come out of the box if you put 27 in. Justify your answer. (There would be 22 cubes. The box always subtracts 5).*
- *Ask: What if 12 cubes came out of the box? How many did I put in? Explain why your answer is correct. (17 cubes went in. You always put in 5 more than you get out. It's the inverse).*
- *Ask: If I put 9 cubes in, is it possible for only 7 to come out? (No, it is not possible because 9 minus 5 does not equal 7).*
- *Ask: What is the relationship between the input and the output numbers? (The relationship always stays the same. It follows a rule).*
- *Say: The relationship between the input and the output always stays the same. You are always subtracting 5.*
- Note: As you complete this engagement piece, discuss the vocabulary words that you hear students using (i.e. “I heard you use the word rule. Why did you use that word?”). You may want to put the words that you hear students use on sentence strips or a piece of chart paper.
- Here is a list of function table vocabulary for teacher reference:
 - Function: A function is set of ordered pairs such that for any first number (the input) there is only one possible second number (the output).
 - Function table: A function table lists pairs of numbers that show a function, or a rule.
 - Input: The first number in a function table.
 - Output: The final number in a function table.
 - Relationship: A relationship describes the connection between the input and the output. The relationship between the input and output stays the same.

- Rule: The rule is a prescribed mathematical method for performing a calculation or solving a problem. The rule stays the same!

Teacher Facilitation

- Students will use cereal to create their own function table on the clean copy of Student Resource 1 (on back).
- First, students should number their function tables with the number assigned to them by the teacher (1 number per student).
- Students should then think of a rule for their function table. Then, they should use that rule to glue cereal in the input and output boxes of Student Resource 1. Students will then record the amount of cereal in the smaller squares within each cell and leave the rule column blank.
- Students should then number a sheet of notebook paper (e.g. 1-16 if there are 16 students).
- Ask the students to place their papers around the room. Students will circle the room in an organized way, attempting to figure out each rule. They will record each rule on their numbered sheet of notebook paper.
- Circulate and attempt to “guess” each student’s rule.
- Distribute Student Resource 2.
- Students will present their cereal function tables within their groups.
- Other students in the group will use the discussion prompts to encourage conversation. Model how to use the discussion cards first. The teacher should circulate amongst the groups to encourage conversation and informally assess student understanding.
- Use one student’s input and output data to model how to complete a function table on a transparency of Student Resource 1. Model your thought process for students: “The numbers are increasing between the input and the output. Only two operations make numbers increase: addition or multiplication: I’m going to test addition and see if that might be the rule.” Continue this line of thinking if addition is not the rule.

Student Application

- Guide students through the function tables on Student Resource 3. (Note: You may want to have students draw in a rule column). As you complete the function tables on the overhead, have students copy down what you are doing on their own piece of paper. Answer key is on Teacher Resource 1.
- *Ask: What is missing from these function tables? (The rule; some input and output numbers).*
- *Ask: Do the numbers increase or decrease between the input and output? (Circle, increase, below the function tables).*
- *Ask: Which two operations make numbers increase? (Addition and multiplication; Write the + and x sign below the function tables).*
- *Ask: What might the rule be?*
- *Ask: Predict how many tickets you would receive if you make 31 baskets? 52? 100?*
- *Ask: What is the difference between the function tables? (the operation, the rule, what they are measuring).*
- *Ask: What other aspect of an amusement park could you measure using a function table? (number of sodas sold, cost of ice cream scoops, etc).*

Embedded Assessment

Students will complete the function table on Student Resource 4. See Teacher Resource 2 for answers.

Reteaching/Extension

- **Remediation:** Encourage students to use a calculator, centimeter cubes, and/or function machine to complete their independent work. Use Student Resource 5 with a small group if students need more practice with basic function tables. Answer key can be found on Teacher Resource 3. Have students circle increase or decrease below each function table (“Are the numbers increasing or decreasing between the input and the output?”), write the two operations that make a number increase or decrease (+ or x for increase, - or \div for decrease), and then test a rule. Once students find a rule, they could circle the operational symbol that worked.
- **Enrichment:** Use Student Resource 6 and have students complete a more complex function table in which they have to determine the rule as well as various input and output numbers. Answers found on Teacher Resource 4. You could provide students with a function table in which the output is provided, but input numbers are missing, forcing students to work backwards to find the answer.

Lesson 2

Pre-Assessment

Distribute Student Resource 7. Two function tables are shown, one with the rule provided and the output numbers blanks and one with the input and output numbers provided but no rule listed. Students will determine which function table is easier to complete and explain why. *(The function table with the rule provided is easier to complete because all you need to do is complete the operation and find the output number. The function table with the missing rule is trickier because you have to think of how to get from one number to another).* See Teacher Resource 5 for answer key.

Launch

- Play “Mystery Operations” as a whole class.
- Before the game, place one cut-out triangle and one cut-out equals sign in each row of a pocket chart.
- The goal of this game is to provide students with numbers and an unknown operation (the cut-out triangle.) As the game progresses, the students need to guess the operation that is needed.
- **Directions:** Give each student one index card. Have students write any number (1-20) on the card. Choose two students to come up and place their index cards in a pocket chart, on either side of the cut-out triangle. You then need to write the answer on an index card and place it in the chart. Two more students then come up and place their numbers on either side of a cut-out triangle. Using the same operation, you write the answer on an index card and place it in the chart. The game progresses until one student guesses the correct operation.

4	\triangle	3 = 7
5	\triangle	3 = 8
6	\triangle	9 = 15
The mystery operation is addition!		

- Note: This game has been adapted from [Mystery Operations](http://www.learner.org/teacherslab/math/patterns/mystery/tested.html).
<http://www.learner.org/teacherslab/math/patterns/mystery/tested.html>

Teacher Facilitation

- Tell students to imagine that they are visiting an amusement park. Have them visualize the colors, people, and rides that they see; imagine the smells of popcorn and cotton candy; and hear the screams of excited kids!
- As students arrive at the park they are handed data about the success of the park, including the number of tickets they can receive, the cost of rides, etc. Students will discover similarities and differences between the three charts. Do not tell students that two of the charts are function tables and one does not follow a pattern.
- Distribute calculators and Student Resource 8. (Note: There are two different copies, so groups may have different charts to work with).
- Students will work in their groups to find the “odd man out,” meaning the chart that does not fit with the other two. As they work, students will compile a list of similarities and differences among the three charts on a piece of chart paper. Guide students to look for patterns and rules on each chart. This is purposefully vague to allow students to come up with their own understandings.
- Note: There are many similarities and differences that the students may identify. (Example: All of the data is increasing; Two of the charts both require multiplication; This one chart is different because the rule uses subtraction; This chart is the “odd man out” because there is not a rule, so it’s not a function table). Make sure that students justify their reasons for picking the chart that is the “odd man out.” (The chart that is the “odd man out” does not follow a consistent rule, so it is not a function table).
- The purpose of this exploration activity is to have students relate function tables to their previous knowledge of patterns and understand what make a chart a function table (it must follow a consistent rule!). See Teacher Resource 6 for answers.
- Have student groups present the list of similarities and differences that they noted. This allows other students to look at the problems in a new light and see multiple ways of making meaning and finding comparisons and contrasts. This also allows you to note students’ thought processes and identify students for remediation and enrichment.
- As students present, you may ask:
 - *Justify your reasons for identifying this chart as the “odd man out.”*
 - *Explain why two of the charts are function tables and the third is not.*
 - *Justify why the third chart is not a function table.*
- Tell students that one of the charts is not a function table because it does not follow a consistent rule. Students should then see that a function table is defined by its rule – the relationship between the input and the output.

Student Application

Students will complete Student Resource 9. This document asks students to justify whether a given chart is a function table or not. See Teacher Resource 7 for an answer key.

Embedded Assessment

Embedded assessment is Student Resource 9.

Reteaching/Extension

- Remediation: Allow students to use a calculator, centimeter cubes, and/or function machine to complete their independent work. You may also have students play this [online game](http://www.mathplayground.com/functionmachine.html) to have extra practice in determining the correct operation.
<http://www.mathplayground.com/functionmachine.html>

- **Enrichment:** Provide students with two growing patterns. One growing pattern should fit in a function table and one should not. Have students determine which growing pattern can be represented in a function table and which cannot. Students should justify their answers. Students could also create their own growing pattern that can be represented in a function table. Furthermore, you may have students play this [online game](http://nlvm.usu.edu/en/NAV/frames_asid_191_g_3_t_1.html) which asks students to solve a function table using a two-operation rule.
http://nlvm.usu.edu/en/NAV/frames_asid_191_g_3_t_1.html

Lesson 3

Pre-Assessment

- Draw the function table below on the board. Have students complete the function table and respond to the prompt: “Justify why this is a function table.”

Number of Tickets Bought	Rule	Amount of Money Paid
24		\$6
16		\$4
32		\$8

Launch

- Distribute Student Resource 10. In groups, students will use pictures of ice cream cones and scoops to determine the answer to the following word problem. (Note: Each student should receive one cone. They will need to determine their number of scoops).
- Write on the board: “The amusement park has a bustling ice cream parlor. At Mr. Icey’s, 8 kids receive 24 scoops, 6 kids receive 18 scoops, and 4 kids receive 12 scoops. How many scoops would you receive at Mr. Icey’s?”
- You might even have students paste their cones and scoops together!

Teacher Facilitation

- *Say: The word problem you just solved was fictional. But every day, there are deals that are actually functions or rules. Can anyone think of any deals that you have seen? (3 pencils for \$0.99).*
- Show students advertisements that could represent a function (e.g. movie costs \$6 per person; 2 sodas for \$1.00) to build student investment in the lesson.
- Distribute scissors, magazines, and newspapers. Challenge students to cut out deals that they find and share with the group.
- Distribute Student Resource 11.
- In their groups, students will explore how to translate a word problem into a function table. The difficulty of these problems lies in determining the rule.
- As groups work, encourage them to use manipulatives and draw pictures to visually represent the problem before putting the data into the function table. See Teacher Resource 8 for the answer key.
- Students will use the function table data that they found in the exploration to create an advertisement. (Note: Directions are found at the bottom of Student Resource 11). Groups will present their advertisement to the class, focusing on why the word problem can be represented in a function table (because it follows a constant rule!).
- After all groups present, briefly model the skill.
- *Ask: How would you measure the success of an amusement park? (You would measure the success by the amount of money that the park makes!).*

- *Ask: How could you figure out the amount of money the park is making everyday? (You would multiply the cost of different items by the number of people that buy those items minus the original cost).*
- *Say: Let's see if we can create a table to see if the amusement park is successful. (Write on chart paper): The cost of admission to the park is \$8 per person. On Monday, 23 people came to the park. On Tuesday, 20 people came to the park. On Wednesday, 31 people came to the park. How much money did the park make each day on admission? How much total money did the park make this week on admission?*
- *Model how to turn this data into a function table.*
- *Ask: If the park receives 13 people tomorrow, predict how much money it will make from admission? (\$104).*
- *Ask: Make a recommendation to the park about how it could gain more money each day from admission. Justify why these recommendations might work. (The park could raise the price of admission or try to get more people to come to the park. Since you are multiplying, you want to increase either the admission price or the number of people to get more money each day).*
- *Ask: Explain why this word problem could be turned into a function table. (It follows a constant rule since admission always costs \$8 per person).*
- *Ask: What if the park raises the price of admission to \$10 per person? Would the function table look the same? Explain. (No, the function table would look different because the rule – multiply by 9 – has changed).*
- *Ask: If the park makes \$176 on Friday, how many people came to the park? How did you find this answer? (22 people came to the park. I divided \$176 – the output – by \$8 to find the input. I did division because it is the inverse of multiplication).*
- *Ask: Can you think of a word problem that could not be turned into a function table? Why is it not a function table? (A black cat weighs 6 pounds and a white cat weighs 5 pounds. How much heavier is the black cat than the white cat? This word problem is not a function table because (1) it does not follow a constant rule and (2) there is not enough data to really even make a table).*

Student Application/Embedded Assessment

- Distribute Student Resource 12.
- In this individual activity, students will apply and extend their knowledge of the connection between word problems and function tables.
- Students will be given a function table, determine the rule, and then write a word problem that represents the data in the function table. See Teacher Resource 9 for the answer key.
- Students should share their word problems with their groups or the class.

Reteaching/Extension

- **Remediation:** When reading a word problem, have students highlight the input data in one color, the rule in another, and the output in a third. Continue to encourage struggling students to use calculators, manipulatives, and the function machine to complete the table. You could also pull a small group and play the [function machine game](http://letsplaymath.wordpress.com/2008/05/13/game-function-machine/).
<http://letsplaymath.wordpress.com/2008/05/13/game-function-machine/>
- **Enrichment:** Have students make up their own word problems and trade them with a partner. The partner then needs to complete a function table that represents the word problem. You could also pull a small group and play the [function machine game](http://letsplaymath.wordpress.com/2008/05/13/game-function-machine/).
<http://letsplaymath.wordpress.com/2008/05/13/game-function-machine/>

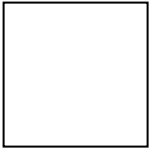
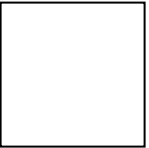
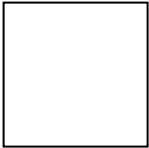
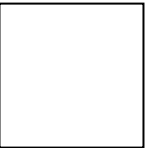
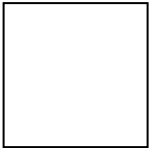
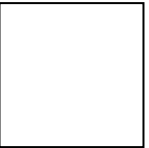
Summative Assessment:

Distribute Student Resource 13. Students will complete an exit slip that tests their mastery of the previous three day's objectives. This assessment should be done completely independently. See answer key on Teacher Resource 10.

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Input	Rule	Output
		
		
		

Ask your group...

- Which column is the input part of your function table?
- Which column is the output?
- What is the rule or function you used?
- What if your input was _____? What would be the output?
- Are any of the function tables in your group the same? How are they the same?
- Why is this function table a good way to organize your information?
- Could your function table be organized in a different way?
- Describe how you figured out what rule you wanted to use.

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Ask your group...

- Which column is the input part of your function table?
- Which column is the output?
- What is the rule or function you used?
- What if your input was _____? What would be the output?
- Are any of the function tables in your group the same? How are they the same?
- Why is this function table a good way to organize your information?
- Could your function table be organized in a different way?
- Describe how you figured out what rule you wanted to use.

Uh Oh!

Directions: Uh oh! There has been information left out of the function tables! First, identify whether the output is increasing or decreasing. Look at the information given to you and use what you have in order to fill out the missing information. Make sure to find the rule!

Rule: _____



(Input) Baskets Made During the game "Shoot Out"	(Output) Tickets Received
5	9
8	12
14	18
20	24
25	

Increase or Decrease

Rule: _____

Total bags of cotton candy sold each day	Total amount made by cotton candy sales
9	\$36
11	\$44
10	\$40
	\$100
15	
20	

Increase or Decrease

Uh Oh Again!

Directions: Uh oh! There is information missing from the tables below. Determine the rule of each function table and fill in this missing information.

Rule: _____

Admission to different amusement parks	Admission to the park WITH a coupon
\$34	\$30
\$29	\$25
\$39	\$35
\$28	
	\$40
	\$21

Increase or Decrease

A new amusement park opens up and an admission ticket is \$100. Using the rule for the table above what would entrance to the park cost with a coupon? Justify your answer using words/number/symbols.

Fun At The Park

Directions: Congratulations! You have just gained more information about your park! Use what you have and fill in the information that is missing from the function tables.

Rule: _____

Popcorn Kernels in the Machine	Popcorn Pieces that Comes out of Machine
25	20
20	15
15	10
10	
40	
	30

Increase or Decrease

Rule: _____

Number of photographs boys take each day	Number of photographs girls take each day
24	19
28	23
30	25
20	
33	
	12

Increase or Decrease

Rule: _____

Points scored on a video game	Tickets received from the video game
10	25
16	31
4	19
25	
	50
	17

Increase or Decrease

A TRIP TO THE PARK

Each student brought \$8 to the park. Fill in the function table.

Number of Students	Total Amount of Money Brought to the Park
5	
9	
	\$192
28	
	\$48

How did you know what rule to use for the function table?

Which Is Easier?

Directions: Look at the two function tables below. Each function table is missing different information. **Complete each function table then answer the question below.**

Input	Rule	Output
2	$\times 3$	
4	$\times 3$	
6	$\times 3$	
10	$\times 3$	
50	$\times 3$	

Input	Rule	Output
5		45
8		72
9		81
2		18
10		90

Which function table is easier to complete? Why do you think this? Use words/numbers/symbols to justify your answer.

Odd Man Out!

Directions: You have gained some more information about the park! Look at the tables below. Which one doesn't belong with the other two? Why do you think this?

Hot Dog Deals at each stand	Price of Each Deal
3	\$12
2	\$6
4	\$12
5	\$15
6	\$24

Cost of cotton candy: \$4

Customers each day	Money gained by cotton candy
23	\$92
26	\$104
36	\$144
20	\$80
30	\$120

Number of Baskets Made	Tickets Gained
10	12
12	14
22	24
30	32
15	17

Odd Man Out!

Directions: You have gained some more information about the park! Look at the tables below. Which one doesn't belong with the other two? Why do you think this?

Cost of the park: \$12

People each day	Total each day
83	\$996
85	\$1020
90	\$1080
100	\$1200

Total amount of money spent on t-shirts each day	Amount of t-shirts sold each day
\$240	24
\$260	26
\$300	30
\$180	18
\$290	29

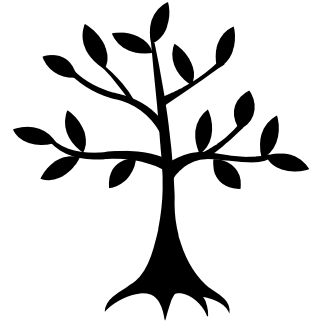
Lemonade deals at each stand	Price per deal
3	\$6
4	\$8
5	\$20
7	\$21
10	\$20

Watch Me Grow!

Directions: The information in the table below represents the height of a tree in feet at the beginning and end of each month.

Height of Tree (ft)

Beginning of Each Month	End of Each Month
3	9
9	27
27	81
81	243



A. Is this a function table?

Yes or No

B. Justify your answer using words/numbers or symbols.

Note to teacher: Cut the cones and scoops apart. Each student will receive 1 cone and at least 3 scoops.



Hot Dog!

Directions:

The cost of a hot dog is \$3. On Monday, 10 people bought a hot dog. On Tuesday, 7 people bought a hot dog. On Wednesday, 6 people bought a hot dog. On Thursday, no one bought a hot dog and on Friday 7 people bought a hot dog.

- 1) Complete the function table.
- 2) Next, use the function table to figure out the TOTAL amount of money the park made on hot dogs during the week.
- 3) Lastly, turn your paper over and follow the directions on the back.



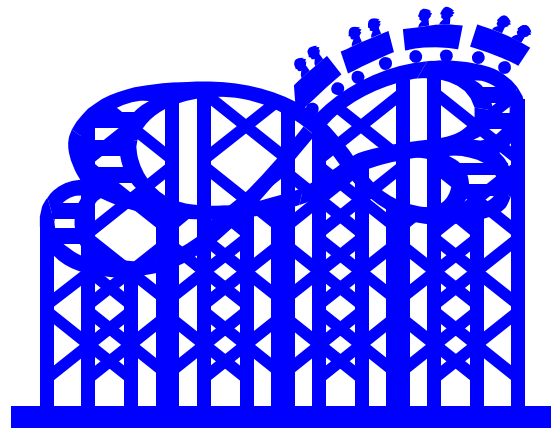
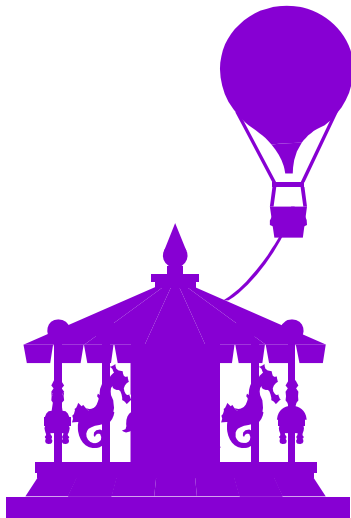
Number of hot dogs purchased each day	Rule	Amount spent on hot dogs each day

TOTAL amount spent on hot dogs: _____

Directions: Answer the questions below.

1) What part of the word problem is the rule? _____

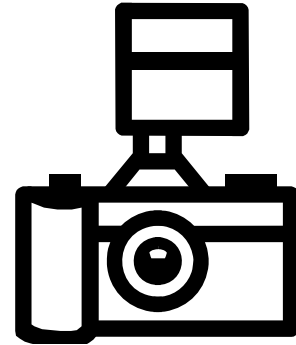
2) There are rules and functions advertised everyday in the real world! Your job is to advertise the rule in your word problem in the best way you can! You could make a TV or radio commercial, sign, banner, or come up with something on your own.



Smile!

Directions:

The cost of a photograph with your friends is \$5. On Monday, 6 people bought a photograph. On Tuesday, 5 people bought a photograph. On Wednesday, 6 people bought a photograph. On Thursday, 7 people bought a photograph and on Friday, no one bought a photograph.



- 1) Complete the function table.
- 2) Next, use the function table to figure out the TOTAL amount of money the park made on hot dogs during the week.
- 3) Lastly, turn your paper over and follow the directions on the back.

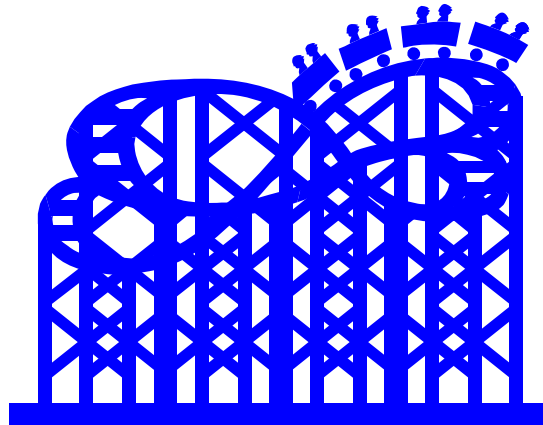
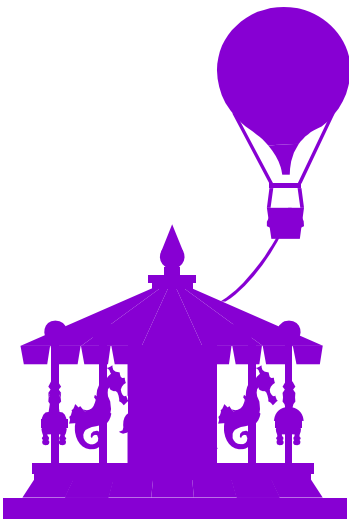
Number of people who bought photographs	Rule	Amount spent on photographs each day

TOTAL amount spent on photographs: _____

Directions: Answer the questions below.

1) What part of the word problem is the rule? _____

2) There are rules and functions advertised everyday in the real world! Your job is to advertise the rule in your word problem in the best way you can! You could make a TV or radio commercial, sign, banner, or come up with something on your own.



You be the Writer!

Directions: Now you be the teacher! Look at the function table below. First, find the rule and complete the function table. Next, ***create a word problem*** to share with the class that describes the completed input, output column and rule column. Be creative!

After you have completed your word problem, remember to go back and fill in the input and output labels on your function table!

Rule: _____

	Rule	
4		16
7		28
		36
11		44
8		
20		80

Functions are Fun!

1)

Directions: Complete the function table below. Remember to determine if the output is *increasing or decreasing* in order to help you find your rule!

Rule: _____

Input	Rule	Output
54		9
48		8
36		
		60
24		4
66		

- Imagine I added another row to the function table below. I input the number 600. What would come out of the function machine?

Use words/number/symbols to explain how you know this.

- 2) The movie theater is having a special and all week long tickets for kids ages 5 are only \$5! The following are the amount of 5 year olds that attended the movies each day:

Sunday: 10
Monday: 11
Tuesday: 3
Wednesday: 8
Thursday: 9
Friday: 15
Saturday: 20

- a) Complete the function table that describes how many people went to the movies during that week.

Rule: _____

Amount of people who attended the movies each day	Rule	Total amount spent at the movies each day

- b) How much money would the movie make if they continued the special and 30 five-year-olds attended the movie on the next Sunday?

3.

a. Do you think function tables are a good way to organize information?

YES

or

NO

b. Why did you answer what you did? Use real life examples and words/numbers/symbols to justify your answer.

Uh Oh!

Directions: Uh oh! There has been information left out of the function tables! First, identify whether the output is increasing or decreasing. Look at the information given to you and use what you have in order to fill out the missing information. Make sure to find the rule!

Rule: Add 4



(Input) Baskets Made During the game "Shoot Out"	(Output) Tickets Received
5	9
8	12
14	18
20	24
25	29

Increase or **Decrease**

Rule: Multiply by 4

Total bags of cotton candy sold each day	Total amount made by cotton candy sales
9	\$36
11	\$44
10	\$40
25	\$100
15	\$60
20	\$80

Increase or **Decrease**

Uh Oh Again!

Directions: Uh oh! There is information missing from the tables below. Determine the rule of each function table and fill in this missing information.

Rule: Subtract 4

Admission to different amusement parks	Admission to the park WITH a coupon
\$34	\$30
\$29	\$25
\$39	\$35
\$28	\$24
\$44	\$40
\$25	\$21

Increase or Decrease

A new amusement park opens up and an entrance ticket is \$100. What would entrance to the park cost with a coupon? Justify your answer using words/number/symbols. Entrance would cost \$96. I found my answer by first finding the rule of the function table. The numbers decrease from the input to the output, and I found the rule was subtract 4. When you do \$100 minus 4, you get \$96.

Fun At The Park

Directions: Congratulations! You have just gained more information about your park! Use what you have and fill in the information that is missing from the function tables.

Rule: Subtract 5

Popcorn Kernels in the Machine	Popcorn Pieces that Comes out of Machine
25	20
20	15
15	10
10	5
40	35
35	30

Increase or Decrease

Rule: Subtract 7

Number of photographs boys take each day	Number of photographs girls take each day
24	17
28	21
30	23
20	13
33	26
19	12

Increase or Decrease

Rule: Add 15

Points scored on a video game	Tickets received from the video game
10	25
16	31
4	19
25	40
35	50
2	17

Increase or Decrease

A TRIP TO THE PARK

Each student brought \$8 to the park. Fill in the function table.

Number of Students	Total Amount of Money Brought to the Park
5	\$40
9	\$72
24	\$192
28	\$224
\$6	\$48

How did you know what rule to use for the function table?

The rule is how much money each student brought to the park.

Which Is Easier?

Directions: Look at the two function tables below. Each function table is missing different information. **Complete each function table then answer the question below.**

Input	Rule	Output
2	$\times 3$	6
4	$\times 3$	12
6	$\times 3$	18
10	$\times 3$	30
50	$\times 3$	150

Input	Rule	Output
5	$\times 9$	45
8	$\times 9$	72
9	$\times 9$	81
2	$\times 9$	18
10	$\times 9$	90

Which function table is easier to complete? Why do you think this? Use words/numbers/symbols to justify your answer.

The first function table is easier to complete because the rule is already given. All I had to do was multiply each input by 3. The second function table is harder because I had to figure out how to get from each input to the output. I had to think through a series of steps to find the rule. I saw that the table increases from the input to the output, and I first tried addition. That didn't work, so I finally tried multiplication and found the rule is $\times 9$.

Directions: You have gained some more information about the park! Look at the tables below. Which one doesn't belong with the other two? Why do you think this?

Hot Dog Deals at each stand	Price of Each Deal
3	\$12
2	\$6
4	\$12
5	\$15
6	\$24

Cost of cotton candy: \$4

Customers each day	Money gained by cotton candy
23	\$92
26	\$104
36	\$144
20	\$80
30	\$120

Number of Baskets Made	Tickets Gained
10	12
12	14
22	24
30	32
15	17

Teacher's Notes:

Answers may vary for groups. May include answers having to do with operation, what the table measures, etc.

Hot Dogs: IS a function table because it follows the rule input times 3 equals output for each pair.

Cotton candy: IS a function table because it follows the rule input times 4 equals output.

Baskets: NOT a function table each pair DOES NOT follow the same rule.

Directions: You have gained some more information about the park! Look at the tables below. Which one doesn't belong with the other two? Why do you think this?

Cost of the park: \$12

People each day	Total each day
83	\$996
85	\$1020
90	\$1080
100	\$1200

Total amount of money spent on t-shirts each day	Amount of t-shirts sold each day
\$240	24
\$260	26
\$300	30
\$180	18
\$290	29

Lemonade Candy deals at each stand	Price per deal
3	\$6
4	\$8
5	\$20
7	\$21
10	\$20

Teacher's Note

Answers may vary for groups. May include answers having to do with operation, what the table measures, etc.

Cost of park: IS a function table because it follows the rule input times 12 equals output for each pair.

T-shirts: IS a function table because it follows the rule input divided by 10 equals output.

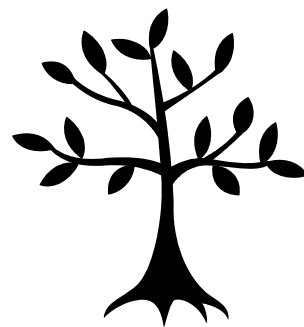
Lemonade: NOT a function table each pair DOES NOT follow the same rule.

Watch Me Grow!

Directions: The information in the table below represents the height of a tree in feet at the beginning and end of each month.

Height of Tree (ft)

Beginning of Each Month	End of Each Month
3	9
9	27
27	81
81	243



B. Is this a function table?

Yes or No

C. Justify your answer using words/numbers or symbols.

Yes, the table above is a function table because it follow the rule of multiplying by 3. (Students should draw a rule column in the function table above).

$3 \times 3 = 9$

$9 \times 3 = 27$

$27 \times 3 = 81$

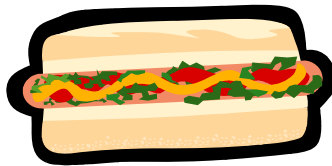
$81 \times 3 = 243$

Hot Dog!

Directions:

The cost of a hot dog is \$3. On Monday, 10 people bought a hot dog. On Tuesday, 7 people bought a hot dog. On Wednesday, 6 people bought a hot dog. On Thursday, no one bought a hot dog and on Friday 7 people bought a hot dog.

- 4) Complete the function table.
- 5) Next, use the function table to figure out the TOTAL amount of money the park made on hot dogs during the week.
- 6) Lastly, turn your paper over and follow the directions on the back.



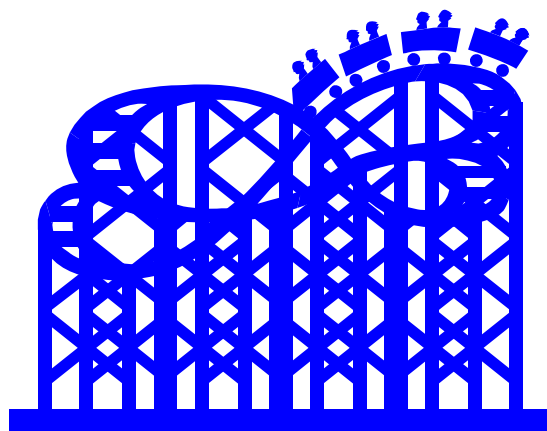
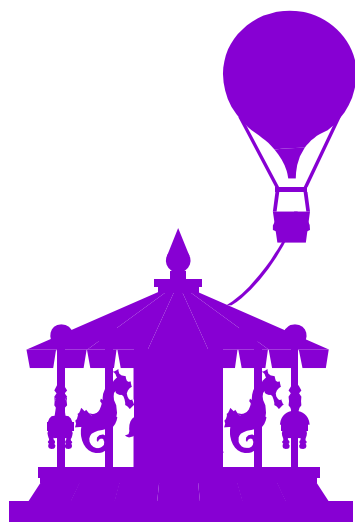
Number of hot dogs purchased each day	Rule	Amount spent on hot dogs each day
10	X3	\$30
7	X3	\$21
6	X3	\$18
0	X3	\$0
7	X3	\$21

TOTAL amount spent on hot dogs: \$90

Directions: Answer the questions below.

1) What part of the word problem is the rule? The cost of one hot dog (\$3) becomes the rule. You multiply the number of hot dogs purchased by 3 to find the amount spent on hot dogs each day.

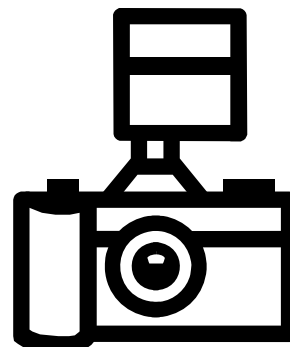
2) There are rules and functions advertised everyday in the real world! Your job is to advertise the rule in your word problem in the best way you can! You could make a TV or radio commercial, sign, banner, or come up with something on your own.



Smile!

Directions:

The cost of a photograph with your friends is \$5. On Monday, 6 people bought a photograph. On Tuesday, 5 people bought a photograph. On Wednesday, 6 people bought a photograph. On Thursday, 7 people bought a photograph and on Friday, no one bought a photograph.



- 4) Complete the function table.
- 5) Next, use the function table to figure out the **TOTAL** amount of money the park made on photographs during the week.
- 6) Lastly, turn your paper over and follow the directions on the back.

Number of people who bought photographs	Rule	Amount spent on photographs each day
6	$\times 5$	\$30
5	$\times 5$	\$25
6	$\times 5$	\$30
7	$\times 5$	\$35
0	$\times 5$	\$0

TOTAL amount spent on photographs: \$120

Directions: Answer the questions below.

1) What part of the word problem is the rule? The price of one photograph (\$5) becomes the rule. You multiply the number of photographs purchased by 5 to find the amount spent on photographs each day.

2) There are rules and functions advertised everyday in the real world! Your job is to advertise the rule in your word problem in the best way you can! You could make a TV or radio commercial, sign, banner, or come up with something on your own.

Directions: Now you be the teacher! Look at the function table below. First, find the rule and complete the function table. Next, ***create a word problem*** to share with the class that describes the completed input, output column and rule column. Be creative!

After you have completed your word problem, remember to go back and fill in the input and output labels on your function table!

Rule: Multiply times 4

	Rule	
4	X 4	16
7	X 4	28
9	X 4	36
11	X 4	44
8	X 4	32
20	X 4	80

Student responses will vary. Word problems must include a one step operation rule that will be followed. Responses should also include the numbers in the input and output columns of the function table that relate to one another using that rule.

Functions are Fun!

1)

Directions: Complete the function table below. Remember to determine if the output is *increasing or decreasing* in order to help you find your rule!

Rule: Divide by 6

Input	Rule	Output
54	$\div 6$	9
48	$\div 6$	8
36	$\div 6$	6
60	$\div 6$	10
24	$\div 6$	4
66	$\div 6$	11

- Imagine I added another row to the function table below. I input the number 600. What would come out of the function machine?

_____ **100** _____

Use words/number/symbols to explain how you know this.

Answers will vary. Student response should indicate they divided 600 by 6 because that is the rule.

- 2) The movie theater is having a special and all week long tickets for kids ages 5 are only \$5! The following are the amount of 5 year olds that attended the movies each day:

Sunday: 10
Monday: 11
Tuesday: 3
Wednesday: 8
Thursday: 9
Friday: 15
Saturday: 20

- c) Complete the function table that describes how many people went to the movies during that week.

Rule: Multiply

by 5

Amount of people who attended the movies each day	Rule	Total amount spent at the movies each day
10	X 5	\$50
11	X 5	\$55
3	X 5	\$15
8	X 5	\$40
9	X 5	\$45
15	X 5	\$75
20	X 5	\$100

- d) How much money would the movie make if they continued the special and 30 five-year-olds attended the movie on the next Sunday?

 \$150

3.

a. Do you think function tables are a good way to organize information?

YES

or

NO

Answers may vary.

c. Why did you answer what you did? Use real life examples and words/numbers/symbols to justify your answer.

Student responses should indicate they understand what a function table is and how it organizes information.